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UTILITY PATENT APPLICATION TRANSMITTAL
(Large Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No. 11-307563US
Total Pages in this Submission

TO THE ASSISTANT COMMISSIONER FOR PATENTS
Box Patent Application
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

SCANNER HAVING COLD-CATHODE-TUBE LIGHT SOURCE AND METHOD OF CONTROLLING A DRIVE SIGNAL FOR ILLUMINATING A COLD-CATHODE-TUBE LIGHT SOURCE

and invented by:

Shinya Kubo and Tetsuichiro Yamamoto

If a CONTINUATION APPLICATION, *check appropriate box and supply the requisite information:*

☐ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: _____

Which is a:

☐ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: _____

Which is a:

☐ **Continuation** ☐ **Divisional** ☐ **Continuation-in-part (CIP)** of prior application No.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below

2. ☒ Specification having **19** pages and including the following:

   a. ☒ Descriptive Title of the Invention

   b. ☐ Cross References to Related Applications *(if applicable)*

   c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*

   d. ☐ Reference to Microfiche Appendix *(if applicable)*

   e. ☒ Background of the Invention

   f. ☒ Brief Summary of the Invention

   g. ☒ Brief Description of the Drawings *(if drawings filed)*

   h. ☒ Detailed Description

   i. ☒ Claim(s) as Classified Below

   j. ☒ Abstract of the Disclosure

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Application Elements (Continued)

3. ☒ Drawing(s) *(when necessary as prescribed by 35 USC 113)*
   a. ☒ Formal Number of Sheets 7
   b. ☐ Informal Number of Sheets

4. ☒ Oath or Declaration
   a. ☒ Newly executed *(original or copy)* ☐ Unexecuted
   b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*
   c. ☒ With Power of Attorney ☐ Without Power of Attorney
   d. ☐ *DELETION OF INVENTOR(S)*
   Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*
The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Computer Program in Microfiche *(Appendix)*

7. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all must be included)*
   a. ☐ Paper Copy
   b. ☐ Computer Readable Copy *(identical to computer copy)*
   c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☒ Assignment Papers *(cover sheet & document(s))*

9. ☐ 37 CFR 3.73(B) Statement *(when there is an assignee)*

10. ☐ English Translation Document *(if applicable)*

11. ☒ Information Disclosure Statement/PTO-1449 ☒ Copies of IDS Citations

12. ☐ Preliminary Amendment

13. ☒ Acknowledgment postcard

14. ☐ Certificate of Mailing
   ☐ First Class ☐ Express Mail *(Specify Label No.):* **HAND DELIVERED**

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Accompanying Application Parts (Continued)

15. ☒ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

16. ☐ Additional Enclosures *(please identify below):*

Request That Application Not Be Published Pursuant To 35 U.S.C. 122(b)(2)

17. ☐ Pursuant to 35 U.S.C. 122(b)(2), Applicant hereby requests that this patent application not be published pursuant to 35 U.S.C. 122(b)(1). Applicant hereby certifies that the invention disclosed in this application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication of applications 18 months after filing of the application.

Warning

An applicant who makes a request not to publish, but who subsequently files in a foreign country or under a multilateral international agreement specified in 35 U.S.C. 122(b)(2)(B)(i), must notify the Director of such filing not later than 45 days after the date of the filing of such foreign or international application. A failure of the applicant to provide such notice within the prescribed period shall result in the application being regarded as abandoned, unless it is shown to the satisfaction of the Director that the delay in submitting the notice was unintentional.

UTILITY PATENT APPLICATION TRANSMITTAL
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Fee Calculation and Transmittal

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra		Rate	Fee
Total Claims	11	- 20 =	0	x	$18.00	$0.00
Indep. Claims	2	- 3 =	0	x	$80.00	$0.00
Multiple Dependent Claims (check if applicable) ☐						$0.00
					BASIC FEE	$710.00
OTHER FEE *(specify purpose)*						$0.00
					TOTAL FILING FEE	$710.00

☒ A check in the amount of **$710.00** to cover the filing fee is enclosed.

☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. **23-1951** as described below. A duplicate copy of this sheet is enclosed.

- ☐ Charge the amount of as filing fee.
- ☒ Credit any overpayment.
- ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Signature

Dated: **October 25, 2000**

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APPLICATION FOR UNITED STATES LETTERS PATENT

Applicants: Shinya Kubo and Tetsuichiro Yamamoto
For: SCANNER HAVING COLD-CATHODE-TUBE LIGHT SOURCE AND METHOD OF CONTROLLING A DRIVE SIGNAL FOR ILLUMINATING A COLD-CATHODE-TUBE LIGHT SOURCE
Docket No.: 11-307563US

SCANNER HAVING COLD-CATHODE-TUBE LIGHT SOURCE AND METHOD OF CONTROLLING A DRIVE SIGNAL FOR ILLUMINATING A COLD-CATHODE-TUBE LIGHT SOURCE

BACKGROUND OF THE INVENTION

The present invention relates to a scanner that illuminates light onto a document and reads in the reflected light. More particularly, the present invention relates to a scanner that has a cold-cathode-tube light source used as a reading light source and a temperature control circuit for the light source.

Conventionally, some scanners of the type, each which illuminates a document and reads the reflected light, are utilized as scanners for facsimile machines or singly as handy type scanners. Light-emitting diode (LED) light sources or cold-cathode-tube light sources are used as the light source for the scanner. The cold-cathode-tube light source can provide a high luminance (brightness) with low power consumption. This light source is effective for high-speed color scanners.

On the other hand, JP-A No. 67485/1999 discloses a color liquid crystal display as a device including a cold-cathode-tube light source. The cold-cathode-tube light source is used as the back light source for color liquid crystal devices.

Generally, there is the problem in that the cold-cathode-tube light source has the disadvantage in that a change in temperature of the saturated vapor pressure of mercury (Hg) within the cold cathode tube causes a change of luminance. The long use of the liquid crystal display, that is, the long lighting time of the cold cathode tube light source strengthens an influence of a temperature rise due to the self heat dissipation from the cold-cathode-tube light source. For that reason, it is necessary to perform the temperature control by detecting the temperature of the cold-cathode-tube light source as nearly as possible to the cold cathode tube.

In other words, for the cold-cathode-tube light source used as the back light for a liquid crystal display, the scheme of controlling the luminance of the back light according to the temperature of the cold-cathode-tube light source is generally used. In this case, the temperature sensor is disposed near the cold-cathode-tube light source.

However, in the case of a scanner, particularly a small handy-type scanner, it is difficult to dispose the temperature sensor near the cold-cathode-tube light source because of the limited assembly space for the control circuit.

Moreover, in the case of the system of lighting the

light source only when the scanner reads a document, the lighting is for a short time of several ten seconds so that the temperature change due to the heat generation of the cold cathode tube itself is small. Hence, in conventional scanners, the temperature rise of the cold-cathode-tube light source is negligible and the temperature control is not performed to the cold-cathode-tube light source.

However, in the case of scanners, when the ambient temperature changes at the lighting start time of the cold-cathode-tube light source (that is, every time of starting a reading operation), the luminance of the cold-cathode-tube light source changes. As a result, the ambient temperature changes the magnitude of an image output signal read out. Particularly, there is the disadvantage in that since a low ambient temperature causes a small magnitude of the image output signal, the S/N ratio of the image output signal is deteriorated, thus degrading the image quality.

In the conventional scanner, a small current is supplied to the cold-cathode-tube light source during non-lighting period to prevent the temperature inside the cold cathode tube from being decreased. However, since the current is continuously flown during non-lighting period, that is, while the document is not being read, the power

consumption increases.

SUMMARY OF THE INVENTION

The objective of the present invention is to solve the above-described tasks.

Also, the objective of the present invention is to provide a scanner that can maintain the luminance of the cold cathode tube to a constant level. In order to realize good efficiency in a simplified structure, the scanner controls the tube current by detecting only the ambient temperature under actual scanner use conditions.

According to the present invention, a scanner comprises a cold-cathode-tube light source for illuminating a surface of a document; a photoelectric conversion element for receiving light reflected from the surface of the document and producing an image signal; a temperature detection circuit for detecting an ambient temperature; and a control circuit for controlling a drive signal according to detected temperature information, the drive signal illuminating the cold-cathode-tube light source when the document is read.

According to the present invention, a method of controlling a drive signal for illuminating a cold-cathode-tube light source comprising the steps of: detecting an ambient temperature and controlling a drive

signal based on said detected temperature information, said drive signal illuminating said cold-cathode-tube light source when said document is read.

In the drive signal control, the current (tube current), voltage, or frequency of the drive signal is controlled. Moreover, the temperature detection circuit and the control circuit are mounted on the circuit board for the existing document reader. This allows temperature control to be realized by adding a minimum number of components, without adding a complicated control circuit.

According to another aspect of the present invention, a scanner comprises a cold-cathode-tube light source for illuminating a surface of a document; a photoelectric conversion element for receiving light reflected from the surface of the document and producing an image signal; an impedance detection circuit for detecting an impedance between electrodes of the cold-cathode-tube light source; and a control circuit for controlling a drive signal according to detected impedance information, the drive signal illuminating the cold-cathode-tube light source when the document is read.

The impedance between electrodes of the cold-cathode-tube light source changes with ambient temperatures. The luminance can be controlled constant by controlling the drive signal of the cold-cathode-tube light source with

the detected impedance.

BRIEF DESCRIPTION OF THE DRAWINGS

This and other objects, features and advantages of the present invention will become more apparent upon a reading of the following detailed description and drawings, in which:

Fig. 1 is a perspective view illustrating the external appearance of a scanner according to an embodiment of the present invention;

Fig. 2 is a cross-sectional view illustrating the scanner shown in Fig. 1;

Fig. 3 is a block diagram illustrating the temperature control circuit for a scanner according to an embodiment of the present invention;

Fig. 4 is a characteristic diagram illustrating the thermistor characteristic of the temperature control circuit shown in Fig. 3 and the corrected characteristic thereof;

Fig. 5 is a circuit diagram illustrating the temperature detection circuit in the temperature control circuit shown in Fig. 3;

Fig. 6 is a circuit diagram illustrating the operation of the boosted-voltage circuit and the dimmer control circuit in the temperature control circuit shown in Fig. 3

and

Fig. 7 is a block diagram illustrating the temperature control circuit according to another embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENTS

Next, embodiment of the present invention will be explained with reference to the attached drawings. Fig. 1 is a perspective view illustrating a scanner according to an embodiment of the present invention. Fig. 2 is a cross-sectional view illustrating the scanner of Fig. 1.

Referring to Fig. 1, numeral 1 represents a handy-type scanner usable alone. A power on/off switch 201 and a scanner switch 202 are mounted on the outer surface of the scanner 1.

The power on/off switch 201 is a power on/off switch for the scanner 1. The scanner switch 202 is turned on when the scanner 1 performs a reading operation and is turned off when the scanner 1 does not perform a reading operation.

A cold-cathode-tube light source 2, as shown in Fig. 2, is mounted within the scanner 1. The light from the cold-cathode-tube light source 2 is reflected back from the surface A of a document to be read. The reflected light is repeatedly reflected between mirrors 3a and 3b and enters

into the photoelectric conversion element 5 via the lens 4. The scanner 1 is provided with the roller 44 for smoothing the movement.

An electrical circuit board 7, on which a temperature control circuit for the cold-cathode-tube light source 2 and a drive circuit for the photoelectric conversion element 5 and a power source circuit, is mounted within the scanner. The thermistor 15, which is a temperature detection element for detecting ambient temperatures, is mounted on the electrical circuit board 7. The thermistor 15 is positioned at any place for detecting ambient temperatures, except places with large heat generation.

Fig. 3 is a block diagram illustrating the temperature control circuit for the cold-cathode-tube light source 2.

Referring to Fig. 3, the temperature control circuit is configured of a switch 12, a boosted-voltage conversion circuit 12, a temperature detection circuit 20, a dimmer control circuit 13 and a control circuit 17. The boosted-voltage conversion circuit 12 boosts a dc voltage of 12 (V) from a power source (not shown) and converts it into a high-frequency signal b of 50KHz. The temperature detection circuit 20 consists of the thermistor 15 for ambient temperature detection and the correction circuit 16. The dimmer control circuit 13 changes the high-frequency signal b from the boosted-voltage circuit 12

according to a temperature detected by the thermistor 15 to produce the drive signal c, thus performing dimmer control to change luminance of the cold-cathode-tube light source 2.

The temperature to resistance characteristic P1 of the thermistor 15 detecting an ambient temperature, as shown in Fig. 4, varies nonlinearly. The correction circuit 16 within the temperature detection circuit 20 converts the non-linear characteristic into the linear characteristic P2 and corrects the thermistor output to linearly vary the resistance of the thermistor 15 due to detected temperature changes. That is, the correction circuit 16 can control the light amount controlling operation of the dimmer control circuit 13 proportionally to the ambient temperature.

Specifically, the correction circuit 16 in the temperature detection circuit 20, as shown in Fig. 5, is configured of a variable resistor R1, a variable resistor R2 and a characteristic compensation circuit K1. The impedance of the correction circuit of Fig. 5 is varied while the resistance values of the variable resistors R1 and R2 are varied. Thus, the output characteristic of the thermistor 15 is approximated to a desired characteristic (the characteristic P2 in Fig. 4). The output of the correction circuit 16 corresponds to the corrected output

voltage a linearly reduced according to an increase in ambient temperature.

In an operation of the scanner 1, the power on/off switch 201 is first turned on. When the document A is read in, the scanner switch 202 is turned on.

When the scan switch 202 is turned on, the control circuit 17, shown in Fig. 3, turns on the switch 10. The switch 10 may be the scan switch 202 itself.

When the switch 10 is turned on, a dc voltage of 12 (V) is supplied to the boosted-voltage conversion circuit 12.

Fig. 6 is a waveform diagram for explaining the operation of the boosted-voltage conversion circuit 12 and the dimmer control circuit 13.

The boosted-voltage conversion circuit 12 boosts the voltage signal of a dc voltage of 12 (V) and produces a high-frequency signal b of which the peak voltage VP is 1500 to 2000 (Vrms) in effective value. The peak voltage VP is sufficient to discharge the cold-cathode-tube light source 2. In this embodiment, the frequency TO of the high-frequency signal b is 50 KHz. However, the frequency TO is not limited to 50KHz.

The dimmer control circuit 13 varies the high-frequency signal b according to the corrected output voltage a and produces the drive signal c which lights the cold-cathode-tube light source 2 and varies the tube current. The drive

signal c is supplied to electrodes (not shown) of the cold-cathode-tube light source 2.

Specifically, the dimmer control circuit 13 controls the light source every period T3 (= T1 + T2) as shown in Fig. 6 and varies the ON time T1 of the high-frequency (b) every period T3 and proportionally to the corrected output voltage a. In other words, the dimmer control circuit 12 produces the drive signal c, which intermittently flows the tube current, and controls the effective tube current according to the applied time. As a result, as the temperature detected by the thermistor 15 increases, the ON time T1 of the drive signal c reduces proportionally to the temperature. Thus, the luminance (light amount) of the cold-cathode-tube light source 2 is maintained constant.

The temperature control circuit of Fig. 3 varies the tube current of the cold-cathode-tube light source 2 according to the ambient temperature detected by the thermistor 15 upon reading the document and maintains the luminance to a constant level thereof. In other words, the dimmer control circuit 13 controls the drive signal c applied to the cold-cathode-tube light source 2 and maintains at all times the luminance to a constant level, independently of the ambient temperature. As a result, the brightness of the light illuminated onto the surface of a document 7 from the cold-cathode-tube light source 4 is

set to a constant level. The magnitude of an image signal for the document A which is read by the photoelectric conversion element 5 via the lens 4 shown in Fig. 1 is set to a constant level. Accordingly, the image quality can be obtained independently of the ambient temperature.

Various methods are considered to the control circuit that produces drive signals for controllably illuminating the cold-cathode-tube light source 2, shown in Fig. 3.

Referring to Fig. 3, the boosted voltage conversion circuit 12 and the dimmer control circuit 13, which generate a lighting voltage, are separated from each other. However, the boosted voltage conversion circuit 12 and the dimmer control circuit 13 may be configured as one control circuit to control the drive signal which illuminates the cold-cathode-tube light source 2 according to the temperature information from the temperature detection circuit 20.

A voltage control circuit may be employed as one example for the control circuit to vary the peak to peak voltage VP of the drive signal c according to the correction output voltage (a). In this case, since the thermistor 15 decreases the voltage of the drive signal c with the increasing ambient temperature, the brightness of the cold-cathode-tube light source 2 is maintained constant.

A voltage/frequency conversion circuit may be employed

for the control circuit to vary the frequency of the drive signal c according to the correction output voltage (a). In this case, since the thermistor 15 decreases the frequency of the drive signal c with the increasing ambient temperature, the brightness of the cold-cathode-tube light source 2 is maintained constant.

In the embodiment of the present invention, the temperature detection circuit and the control circuit may be configured of digital circuits. In this case, the control circuit produces drive signals with predetermined waveforms previously stored in the ROM according to the temperature digital information from the temperature detection circuit and boosts the voltage of the drive signal to 1500 to 2000 (Vrms) to drive the cold-cathode-tube light source 2.

As described above, in the embodiment of the present invention, the tube current value is controlled while the ambient temperature is being observed, so that the luminance upon scanning is controlled to a constant level. That control enables the tube current value to be uniquely determined upon scanning according to ambient temperatures. Thus, a constant luminance can be obtained at all times over the range (5 to 35 ° C) of ambient temperatures where systems such as scanners or facsimile machines are used. Thus, an image quality at a constant

level can be obtained independently of the ambient temperature.

Fig. 7 is a block diagram illustrating another embodiment of the present invention. According to this embodiment, the impedance detection circuit 30 that detects net variations in impedance of the cold cathode tube of the cold-cathode-tube light source 2 is replaced for the temperature detection circuit 20 of Fig. 3.

The impedance detection circuit 30 detects the impedance of the cold-cathode-tube light source 2, which varies according to ambient temperatures, and then produces the voltage signal d varying according to the impedance value.

The dimmer control circuit 13 controls the drive signal supplied to the cathode-tube light source 2 according to the voltage signal d. The drive signal controls the tube current, voltage, or frequency, as described in the previous embodiment.

Such a configuration can maintain the luminance of the cold-cathode-tube light source to a constant level, independently of ambient temperatures.

As described above, a sole scanner or scanners for facsimile machines, using a cold cathode tube acting as a light source, embodying the present invention, can maintain the luminance of the cold-cathode-tube light source to a constant level, independently of ambient

temperatures.

Maintaining the luminance constant, independent on the ambient temperature, allows the peak follower circuit arranged in the prior art image processing circuit to be eliminated so that the cost reduction of the whole system can be realized. Moreover, the resultant effect is that the S/N ratio of an image signal becomes constant independently of the ambient temperature and that deterioration in image quality is small.

According to the present invention, the temperature detection element that detects only the ambient temperature, not being the temperature of the cold-cathode-tube light source, can be provided at any places, except places with large heat dissipation within the system. This feature enables the freedom in circuit design to be increased. The temperature detection element can be realized by adding to a minimum number of components to the circuit configuration of the prior-art document reader.

What is claimed is:

1 A scanner comprising:

a cold-cathode-tube light source for illuminating a surface of a document;

a photoelectric conversion element for receiving light reflected from the surface of said document and producing an image signal;

a temperature detection circuit for detecting an ambient temperature; and

a control circuit for controlling a drive signal according to detected temperature information, said drive signal illuminating said cold-cathode-tube light source when said document is read.

2 The scanner defined in Claim 1, wherein said control circuit controls the current of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

3 The scanner defined in Claim 1, wherein said control circuit controls the voltage of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

4 The scanner defined in Claim 1, wherein said control circuit controls an applied time of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading

said document.

5 The scanner defined in Claim 1, wherein said control circuit controls the frequency of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

6 A scanner comprising:

a cold-cathode-tube light source for illuminating a surface of a document;

a photoelectric conversion element for receiving light reflected from the surface of said document and producing an image signal;

an impedance detection circuit for detecting an impedance between electrodes of said cold-cathode-tube light source; and

a control circuit for controlling a drive signal according to detected impedance information, said drive signal illuminating said cold-cathode-tube light source when said document is read.

7 A method of controlling a drive signal for illuminating a cold-cathode-tube light source comprising the steps of:

detecting an ambient temperature and

controlling a drive signal based on said detected temperature information, said drive signal illuminating said cold-cathode-tube light source when said document is

read.

8 The method of controlling a drive signal for illuminating a cold-cathode-tube light source defined in Claim 7, wherein said step of controls the current of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

9 The method of controlling a drive signal for illuminating a cold-cathode-tube light source defined in Claim 7, wherein said step of controls the voltage of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

10 The method of controlling a drive signal for illuminating a cold-cathode-tube light source defined in Claim 7, wherein said step of controls an applied time of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

11 The method of controlling a drive signal for illuminating a cold-cathode-tube light source defined in Claim 7, wherein said step of controls the frequency of said drive signal applied on electrodes of said cold-cathode-tube light source based on said temperature information upon reading said document.

ABSTRACT

The scanner includes the switch 12 that is closed when a document is read, the boosted-voltage conversion circuit 12 that boosts a dc voltage of 12 (V) supplied from a power source (not shown) and then converts it into a high-frequency signal b of 50 KHz, the temperature detection circuit 20 formed of the thermistor 15 for ambient temperature detection and correction circuit 16, and the dimmer control circuit 13 that varies the high-frequency signal b from the boosted-voltage conversion circuit 12 according to a temperature detected by the thermistor 15 and produces a drive signal c to vary the luminance of the cold-cathode-tube light source 2.

FIG.1

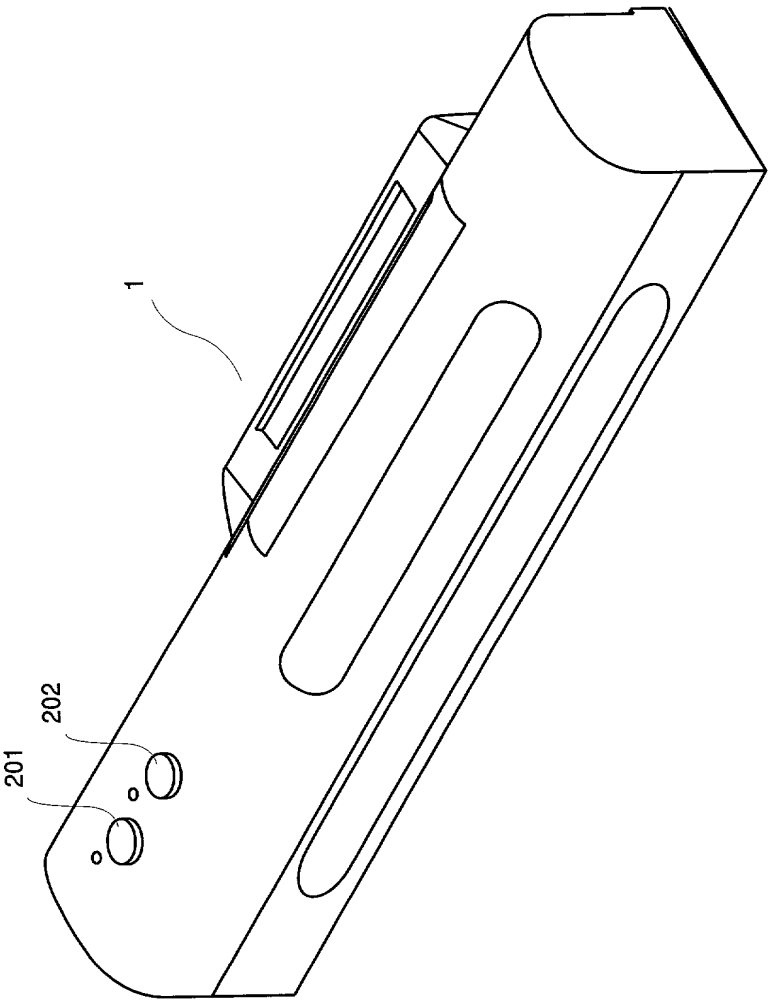


FIG.2

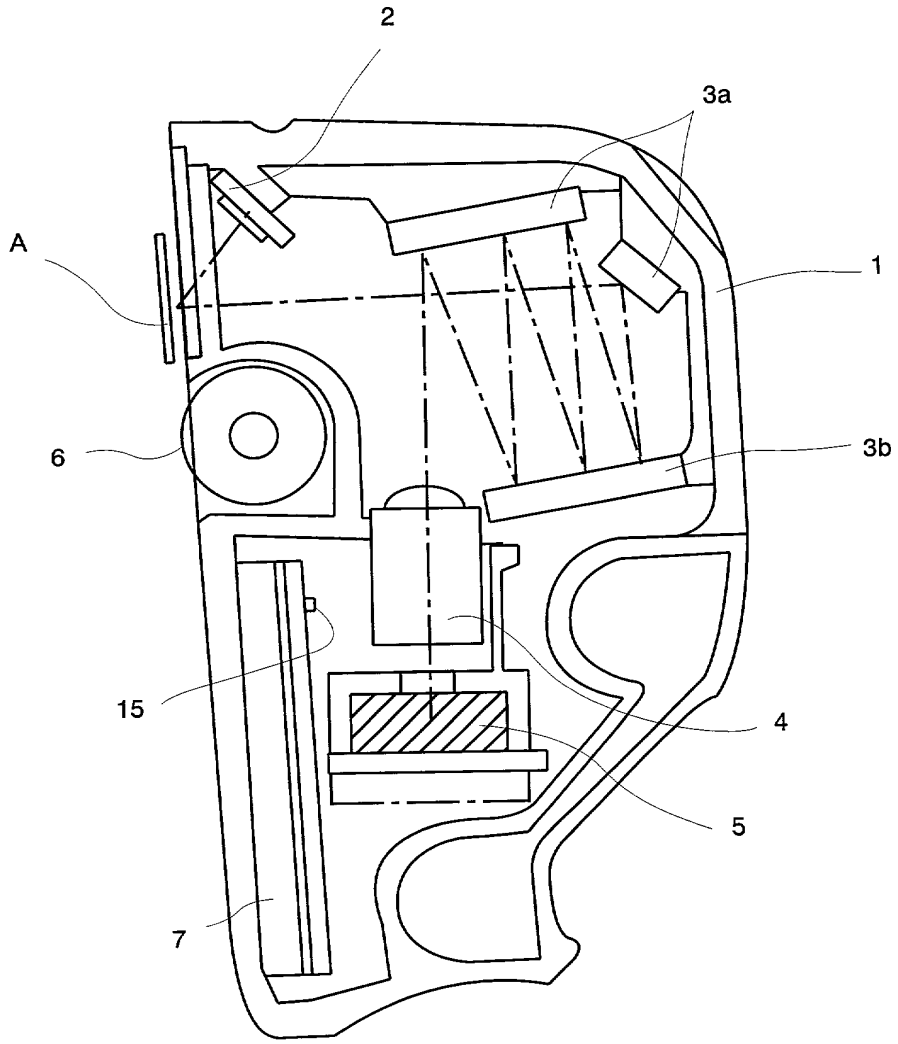


FIG. 3

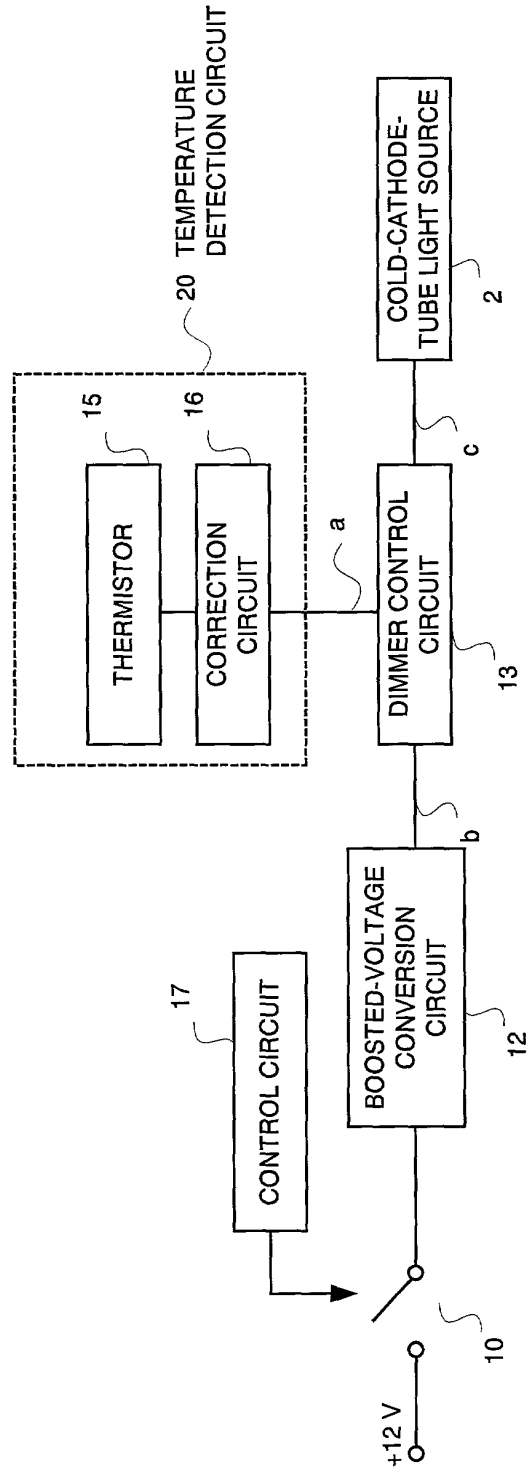

+12 V
10
CONTROL CIRCUIT
17
BOOSTED-VOLTAGE CONVERSION CIRCUIT
12
b
DIMMER CONTROL CIRCUIT
13
c
COLD-CATHODE-TUBE LIGHT SOURCE
2
a
20 TEMPERATURE DETECTION CIRCUIT
THERMISTOR
15
CORRECTION CIRCUIT
16

FIG. 4

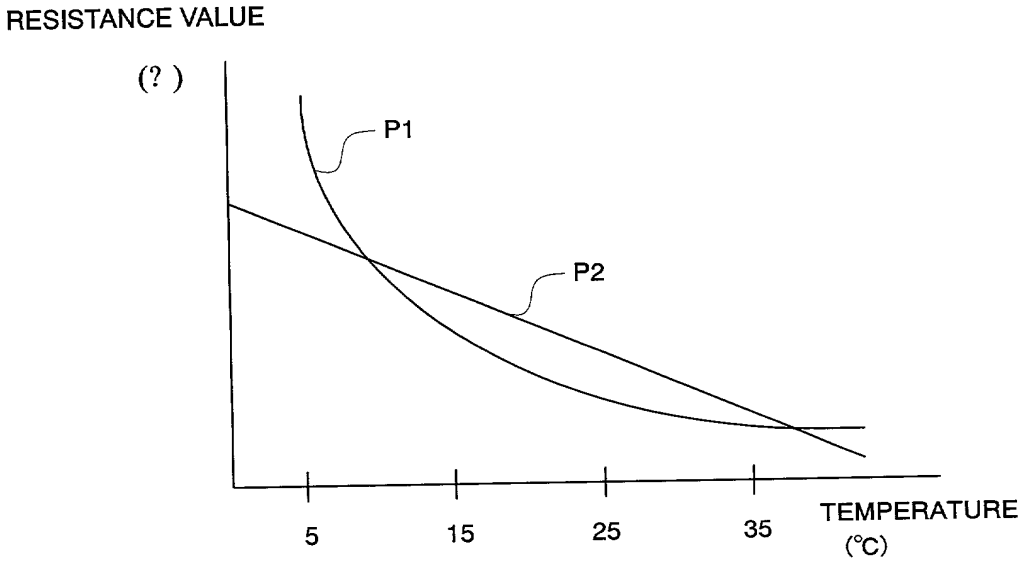


FIG. 5

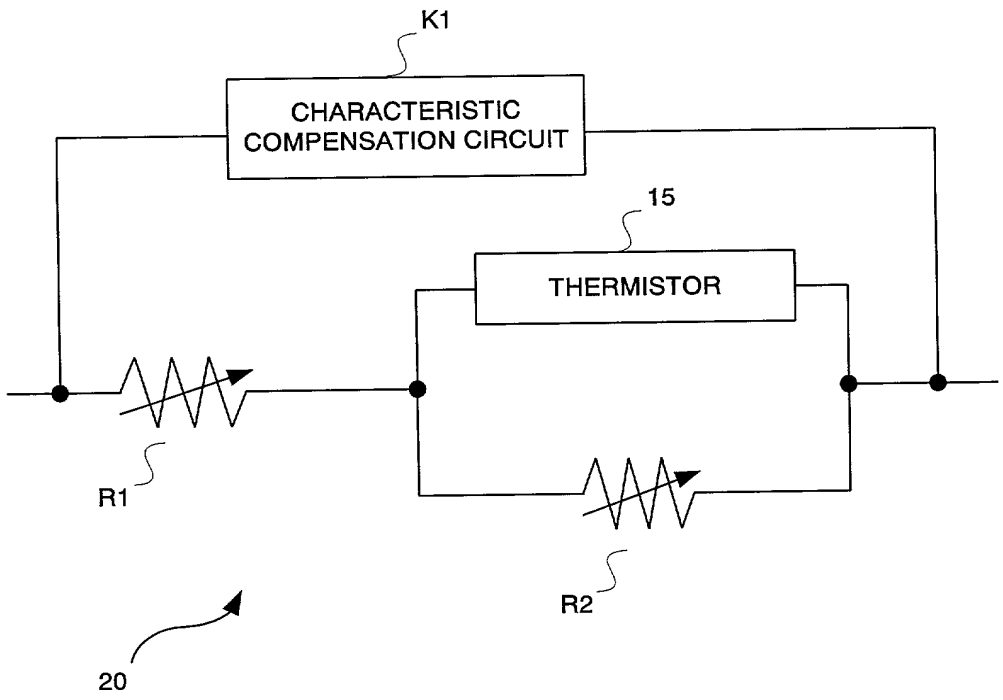

K1
CHARACTERISTIC COMPENSATION CIRCUIT
15
THERMISTOR
R1
R2
20

FIG.6

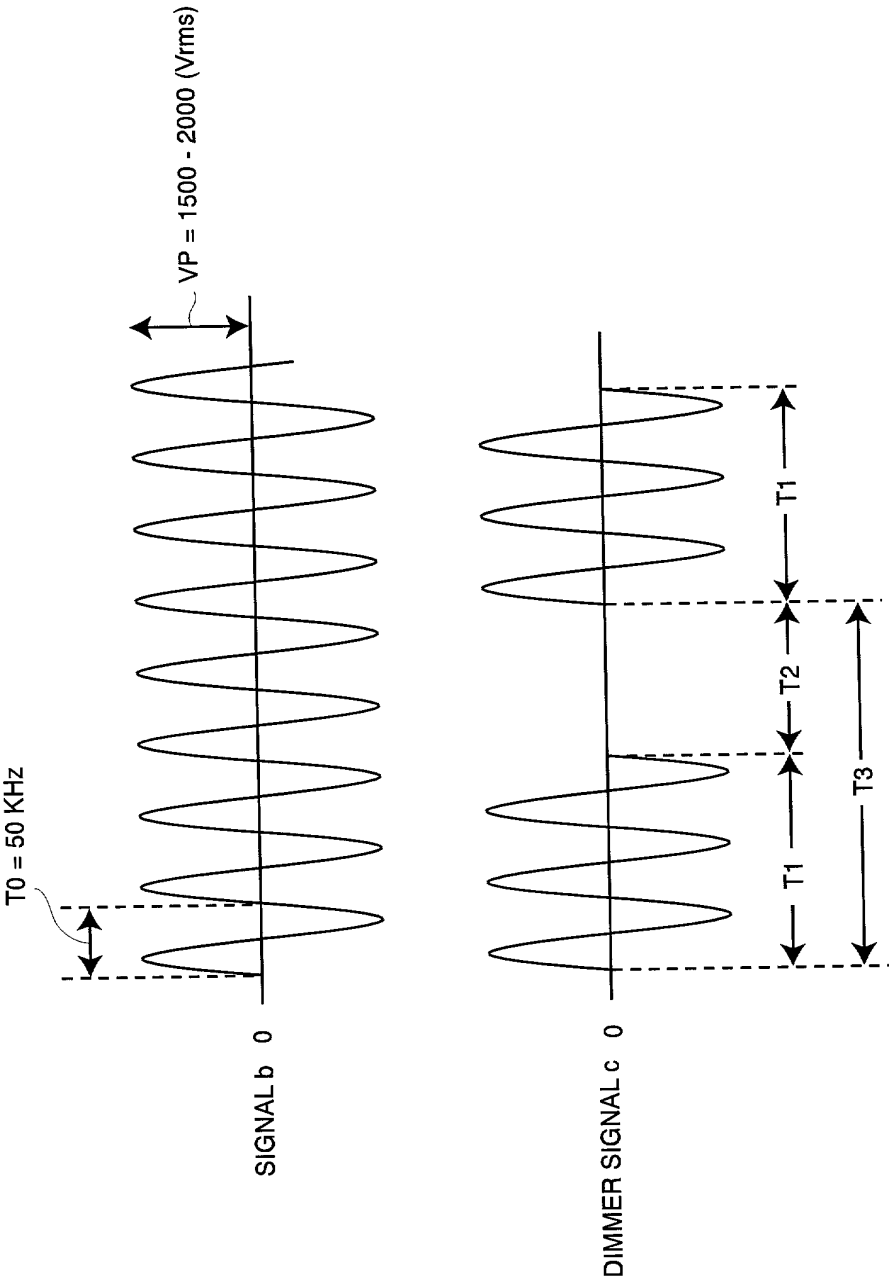
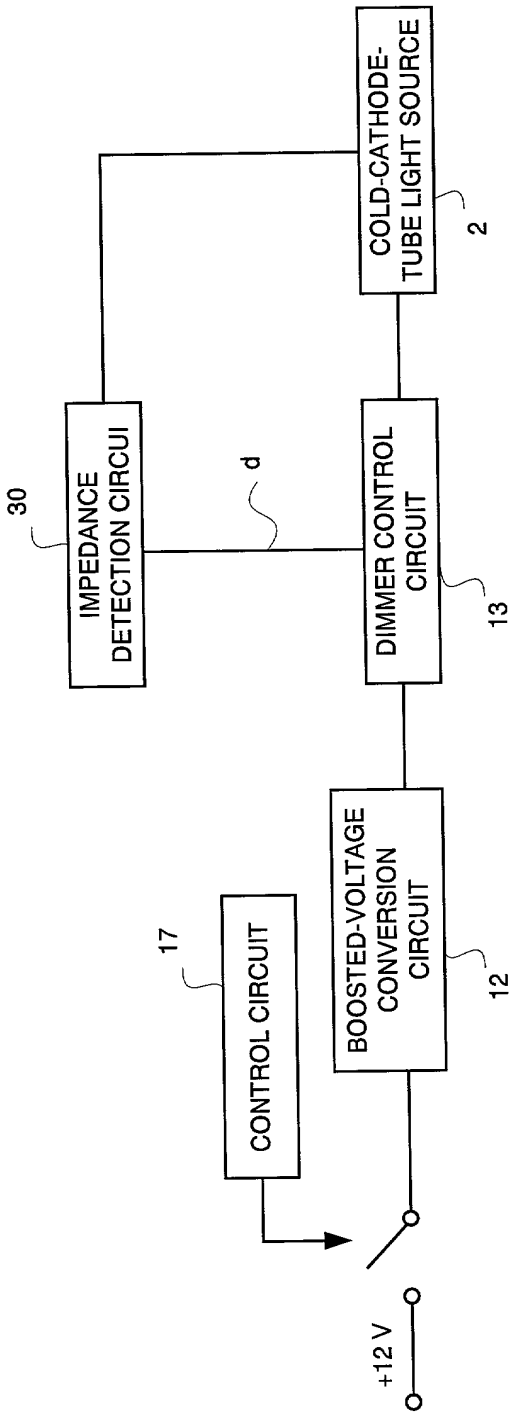

VP = 1500 - 2000 (Vrms)
T0 = 50 KHz
SIGNAL b 0
DIMMER SIGNAL c 0
T1
T2
T1
T3

FIG. 7


COLD-CATHODE-TUBE LIGHT SOURCE
2
IMPEDANCE DETECTION CIRCUI
30
d
DIMMER CONTROL CIRCUIT
13
BOOSTED-VOLTAGE CONVERSION CIRCUIT
12
CONTROL CIRCUIT
17
+12 V

宇高11-307563 US

Application for United States Patent

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled SCANNER HAVING COLD-CATHODE-TUBE LIGHT SOURCE AND METHOD OF CONTROLLING A DRIVE SIGNAL FOR ILLUMINATING A COLD-CATHODE-TUBE LIGHT SOURCE

the specification of which:

(check one)

☑ is attached hereto

☐ was filed on _____, as Application Serial No. _____ and was amended on _____. (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56*

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			priority claimed	
11-307563	Japan	28/October/1999	✓ yes	— no
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____	— yes	— no
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____	— yes	— no
(Number)	(Country)	(Day/Month/Year Filed)		

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

Power of Attorney: As a named inventor, I hereby appoint C. Lamont Whitham, Reg. No. 22,424, Marshall M. Curtis, Reg. No. 33,138, and Michael E. Whitham, Reg. No. 32,635, as attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. All correspondence should be directed to Whitham, Curtis & Whitham, Reston International Center, 11800 Sunrise Valley Dr., Suite 900, Reston, Virginia 20191. Telephone calls should be directed to Whitham, Curtis & Whitham at (703) 391-2510.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

宇高11-307563US

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*Title 37, Code of Federal Regulations, § 1.56:

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith toward the Patent and Trademark Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and (1) it establishes , by itself or in combination with other information, a prima facie case of unpatentability; or (2) it refutes, or is inconsistent with, a position the applicant takes in: (i) opposing an argument of unpatentability relied on by the Office, or (ii) asserting an argument of patentability.